

2003-2004

RESEARCH ACTIVITIES

DEPARTMENT OF SYSTEMS

ENGINEERING & MANAGEMENT

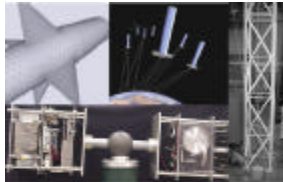
ENGINEERING MANAGEMENT
ENVIRONMENTAL ENGINEERING
SYSTEMS, INFORMATION,
& COST ANALYSIS
PROGRAMS



GRADUATE SCHOOL OF
ENGINEERING
AND
MANAGEMENT

Air Force Institute of Technology

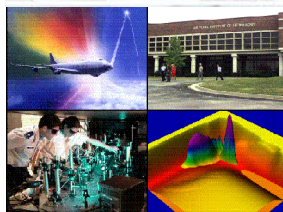
Four other department booklets that report on research activities are available from the Air Force Institute of Technology. These include:



Aeronautics and Astronautics



Electrical and Computer Engineering



Engineering Physics



Operational Sciences

If you are interested in learning more about the above departments research activities and need its booklet, or if you have any general questions about the Graduate School of Engineering and Management, contact AFIT/ENR at DSN 785-3636, ext 4546.

TABLE OF CONTENTS

Department of Systems and Engineering Management.....	1
Cost Analysis.....	3
Engineering and Environmental Management.....	4
Applied Environmental Sciences.....	5
Environmental Systems Analysis and Management.....	6
Leadership and Management.....	7
Applied Decision Analysis.....	9
Environmental Engineering and Science.....	10
Strategic Purchasing	11
Systems Management	12
Information Resource / Information Systems Management	13
Faculty Contact List	15
Collaborating Faculty	15
Research Information	16
Sample Thesis Topic Proposal	17

Visit our website for more information about the Department of Systems and Engineering Management and its programs, faculty, and curricula at <http://en.afit.edu/env/>

Systems and Engineering Management



Col Joseph H. Amend III

Department Head

PhD, Virginia Polytechnic Institute and State University, 1973

The Department of Systems and Engineering Management (AFIT/ENV) provides graduate education leading to a master's degree and research designed to address the needs of various US Air Force career fields. The department admits approximately 80 students per year for full-time graduate study. They are instructed and guided by 19 full-time faculty and emeriti professors. These resources provide a strong capability to apply focused problem-solving and analytical skills to Air Force and DoD problems.

The **Graduate Cost Analysis (GCA)** program primarily supports the cost analysts in the financial management career field (AFSC of 65WX). The program is designed to ensure that students understand the cost analyst's environment and role, the concepts of cost modeling and estimation, and the application of quantitative techniques used in cost estimation and cost analysis.

The **Graduate Engineering Management (GEM)** program primarily supports the civil engineer community (AFSC of 32XX). The program is designed to provide relevant graduate education in the management of base, infrastructure, and facility resources and processes consistent with future duties across the spectrum of the civil engineer's mission. The program is also popular among USAF Bioenvironmental Engineers and US Marine Corps officers.

The **Graduate Environmental Engineering and Science (GES)** program primarily supports the bioenvironmental (BEE) career field (AFSC of 43EX). The program is designed to provide BEE members an in-depth understanding of environmental processes and their impact on human health.

The **Graduate Information Resource (GIR)** and **Graduate Information Systems (GIS)** management programs support the communications and information officer career field (AFSC of 33SX). The programs are designed to provide students with the knowledge and skills needed to oversee the information management and information systems needs of Air Force and DoD organizations in future assignments as middle and upper-level managers. The programs provide students with a broad perspective of DoD information issues, including information architectures, process support, and the implications of rapidly evolving information technology.

The **Graduate Strategic Purchasing** (GSP) program is applicable for individuals in the Contracting (64XX) career field. The program is designed to improve the student's ability to manage in a systems contracting environment. It focuses on building technical and managerial skills in the areas of systems life cycle, development, and production; as well as purchasing and supply chain management, strategic purchasing concepts, and entrepreneurship; and cost analysis.

The **Graduate Systems Management** (GSM) program is designed to support acquisition officers (AFSC of 63AX). The program is designed to provide an in-depth study of the unique challenges associated with managing systems engineering processes. The goal is for students to be able to provide better strategic direction and tactical implementation for all phases of weapon system development and to incorporate risk management techniques in project management responsibilities.



Cost Analysis



Research Areas

- Weapon Systems Value
- Cost Estimating Techniques
- Risk Analysis and Mitigation
- Earned Value Management
- Production Modeling
- Mathematical Cost Modeling

Recent Successes

The Graduate Cost Analysis (GCA) program is designed to support DoD and USAF cost analysts involved in weapon system programs. Past research efforts have lead to the development of groundbreaking techniques for determining best-value source selections, thereby enabling decision makers to “dollarize” the strengths, weaknesses, and risks inherent in an offeror’s proposals. Student research has shown that Weibull distribution analysis of established program funding profiles can predict future program cost and schedule overruns. With its focus on cost modeling and quantitative techniques used in cost estimation and analysis, the cost analysis program clearly has applicability across a wide range of topics and is ideally suited for the interdisciplinary efforts of the

department. Additional research has focused on developing models that provide decision makers with quantitative tools to determine both the likelihood that a weapon system acquisition program is a candidate for cost growth and the potential magnitude of such growth. Also, preliminary research has been completed in areas of developing cost per orbit hour factors for space systems and in integrating cost as an independent variable (CAIV) and incremental acquisition.

Contact Information



Maj Michael (Mike) A. Greiner

Assistant Professor of Cost Analysis

PhD, Industrial Engineering
Arizona State University
Tel: (937) 255-3636 x4588 (DSN 785-3636)
Email: michael.greiner@afit.edu

Research Interests:

- Acquisition reform and the cost management relationship
- Risk management and mitigation
- Weapon systems development

Engineering Management

Environmental Engineering and Science

The Graduate Engineering Management (GEM) and Graduate Environmental Engineering and Science (GES) programs share a common core of courses and faculty. Each program provides students with the opportunity to learn and exercise a variety of quantitative and qualitative concepts, skills, and techniques to integrate engineering, science, and policy issues into a decision-making framework for optimum performance in their respective career fields. Thus, the research in this diverse program ranges across management, technical, and scientific disciplines. Applicable research for each program is described in the following pages. Within the GEM program, various specialty sequences exist: Applied Environmental Sciences, Environmental Systems Analysis and Management, Leadership and Management, Information Technology Management, and Applied Decision Analysis.



A-76 Process Model

Applied Environmental Sciences

Facilities

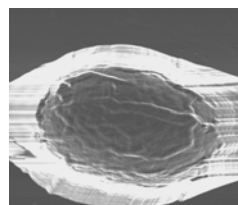
New laboratory facilities allow carefully controlled, laboratory-oriented experiments in environmental microbiology, chemistry, and engineering. With these state-of-the-art facilities, field-scale remediation projects can also be monitored.



**Innovative Groundwater
Remediation Technology
Bio-Enhanced In-well Vapor Stripping
(BEHIVS)**

Recent Successes

Student research in the Applied Environmental Sciences area varies from the laboratory oriented microscopic examination of spores to field-scale groundwater remediation projects. Biodegradation of spent materials, from aircraft deicer components to fuels, has been the focus of recent laboratory-based theses. Computer modeling of field-scale remediation of DoD contaminants of interest, such as trichloroethylene, perchlorate, and explosives, is also an active research area.



Atomic Force Microscopy image of *Bacillus* spore

Contact Information



Dr Charles A. Bleckmann

Associate Professor of Engineering and Environmental Management

PhD, Botany, University of Arizona
Tel: (937) 255-3636 x4721 (DSN 785-3636)
Email: Charles.Bleckmann@afit.af.edu

Research Interests:

- Wastewater analyses and treatment
- Microbial identification
- Groundwater monitoring and remediation
- Biodegradation of wastes
- Fuel biodeterioration and biodegradation



Dr Mark N. Goltz

Professor of Engineering and Environmental Management

PhD, Environmental Engineering and Science
Stanford University
Tel: (937) 255-3636 x4638 (DSN 785-3636)
Email: Mark.Goltz@afit.edu

Research Interests:

- Hazardous waste site remediation
- Fate and transport of organic contaminants in the subsurface
- Groundwater remediation technologies

Environmental Systems Analysis and Management

Research Areas

- Ecosystem Engineering
- Resource Management
- System Dynamics Analysis
- Fate and Effects in Biosystems
- Pharmacokinetic Modeling

Recent Successes

Through systems analysis of natural ecosystem processes, modeling efforts have demonstrated how the unique conditions within wetlands (plant species and soil conditions) can be used to remediate chlorinated solvent contamination. These conditions have been reproduced physically in the laboratory and in pilot-scale columns, and AFIT has completed the construction of a field scale artificial wetland to cleanup an actual groundwater plume of tetrachloroethylene (PCE). Findings over 2 years of study have demonstrated the destruction of all contaminants and hazardous by-products and have posed new research questions to optimize this technology, which will save millions of dollars across the Air Force and billions nationally.

Collaborating faculty:

Dr James Amon, Wright State University

Dr Abinash Agrawal, Wright State University



Facilities

AFIT's new state-of-the-art laboratory allows experimentation with various environmental media to explore new technology designs arising from computer analysis. These findings confirm and refine initial concepts, and optimal design specifications are explored using the latest systems analysis software supported by powerful computer facilities.

Contact Information



Dr Michael L. Shelley

Associate Professor of Engineering and Environmental Management

PhD, Environmental Science and Engineering
University of Florida

Tel: (937) 255-3636 x4594 (DSN 785-3636)

Email: Michael.Shelley@afit.edu

Research Interests:

- System dynamics modeling in analyzing long-term management strategies
- Abiotic and biochemical contaminant fate and transport
- Physiologically-based pharmacokinetic modeling
- Ecological engineering design to optimize environmental program management

Leadership and Management

Research Areas

- Human Resources in Organizations
- Personnel Management and Evaluation
- Organizational Behavior and Management
- Organizational Change and Development
- Strategic Management
- Leadership Theory
- Outsourcing and Privatization

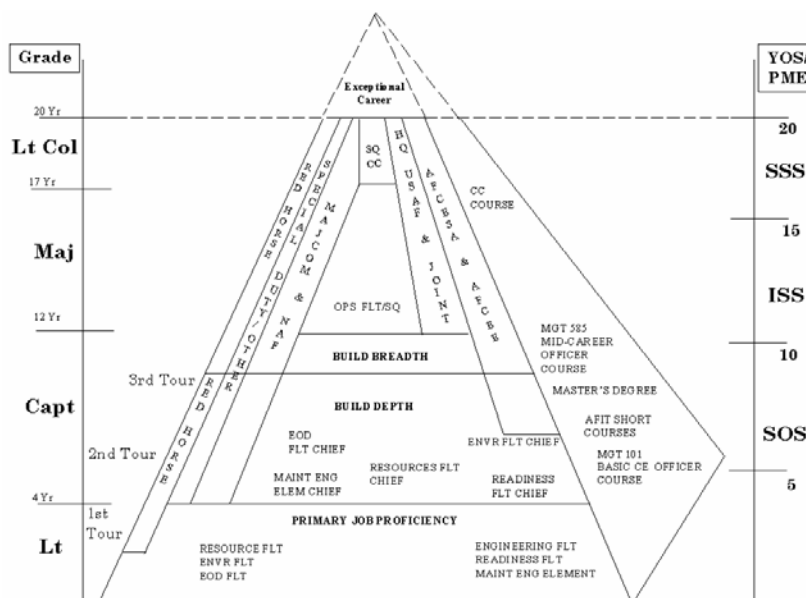
Recent Successes

AFIT researchers evaluated the Civil Engineer Career Pyramid, the published Air Force career guidance for civil engineer officers. The analysis provided empirical data supporting the guidance and suggested a wider definition of success. Another active area of research is the investigation of the efficiencies of Most Efficient Organization (MEO) and contractor-operated Operations Flights to include examination of their respective organizations and management practices.

AFIT researchers have explored an array of management issues related to the retention of Air Force civil engineer officers. Focusing on contemporary challenges, these projects explored the impact of outsourcing and training opportunities on officers' career satisfaction levels and their decision to leave the service. Taken together, these studies have highlighted the complex problems that Air Force leaders face when recruiting, selecting, training, and retaining skilled officers. This research stream continues with current studies examining the Expeditionary Aerospace Force.

Resources

Faculty and students have access to the most sophisticated research tools available to systematically diagnose and address organizational problems. In addition, AFIT's state-of-the-art group decision-making laboratory gives researchers the opportunity to develop controlled experiments and provides Air Force leaders an ideal place to address organizational issues through the application of team techniques.



Contact Information



Maj Daniel (Danny) T. Holt

Assistant Professor of Engineering and
Environmental Management

PhD, Organizational Analysis and Change
University of Auburn
Tel: (937) 255-3636 x4574 (DSN 785-3636)
Email: Daniel.Holt@afit.edu

Research Interests:

- Environmental attitudes
- Organizational change
- Human personality and emotions
- Survey development



Dr. Jan P. Muczyk

Chair of Executive Education and Professor of
Management

DBA, Organizational Behavior
University of Maryland
Tel: (937) 255-6565 x4315 (DSN 785-6565)
Email: Jan.Muczyk@afit.edu

Research Interests:

- Leadership
- Streamlining bureaucracy
- Strategy implementation

Applied Decision Analysis

Research Areas

- Operations Research
- Project Management
- Decision Analysis Theory & Methods
- Risk Analysis Theory & Methodology
- Multiple Criteria Decision Making

Recent Findings

Applied decision analysis tools can be utilized in virtually any research area. AFIT researchers are using multiple criteria decision-making concepts to analyze the optimal organizational structure of Civil Engineer organizations. Recent examples include a revised RED HORSE structure to improve contingency response and heavy construction capability, a decision support model to help determine the appropriate structure for an Operations Flight given a set of operational conditions for the base, a proposed MILCON model that more effectively targets deficient facility class requirements, and a decision tool to help decision-makers at the AF Force Protection Battlelab select initiatives for further study.

This is the era of Air Force “Transformation,” and the CE career field must change to support the new Capabilities-Based Task Forces CONOPS. Student research has kept up with this need, rigorously testing the current GEOBASE software (GeoBEST) using prospective users in a realistic “hands-on” scenario. The study provided essential information to Air Force decision makers on the usability of GeoBEST, and examined the training and fine-tuning needed in future systems to handle the complexity and tight time constraints of beddown planning.



Example of a Common Installation Picture in GEOBASE

Contact Information



Lt Col Alfred (Al) E. Thal, Jr.

Assistant Professor of Engineering and Environmental Management

PhD, Environmental Engineering,
University of Oklahoma
Tel: (937) 255-3636 x4798 (DSN 785-3636)
Email: Alfred.Thal@afit.edu

Research Interests:

- Engineering management
- Readiness and training
- Facility and infrastructure maintenance
- Environmental policy and management

Environmental Engineering and Science

Research Areas

- Drinking Water System Vulnerability
- Green Roof Technology Application
- Sustainable Energy Use

Recent Successes

Recent events in history have demonstrated that employing sustainable energy sources and sustainable building design is in the country's best interest. In response to this goal, current research activities explore the use of green roofs on buildings to promote energy efficiency, the use of models to identify the most appropriate sustainable energy choice for a particular location, and methods to protect critical infrastructure. Sustainable building design research is conducted in partnership with the Wright-Patterson AFB Pollution Prevention Office.



Facilities

AFIT owns a large variety of aerosol sampling equipment and a complete analytical chemistry lab employing the techniques of atomic absorption spectroscopy, high pressure liquid chromatography, gas chromatography, all housed in a new multi-million dollar facility.



Contact Information



Maj Ellen England

Assistant Professor of Engineering and Environmental Management

PhD, Environmental Engineering,
University of Missouri-Rolla
Tel: (937) 255-3636 x4711 (DSN 785-3636)
Email: Ellen.England@afit.edu

Research Interests:

- Occupational exposure assessment
- Sustainable design
- Membrane biofiltration of air

Strategic Purchasing

Research Areas

- Applying “Best Commercial Practices” to DoD Acquisitions
- Applying the Entrepreneurial Mindset in Organizations
- Supply Chain Management
- Strategic Outsourcing
- E-Commerce and E-Purchasing

Recent Successes

The strategic purchasing program is designed to support the efforts of contracting specialists during all phases of DoD purchasing and supply chain management. This includes state-of-the-art acquisition policies and objectives of DoD and the application of best commercial practices in strategic purchasing and supply chain management. Student research has revealed that many of the benefits of A-76 privatization and outsourcing may be obtained by requiring DoD organizations to function as “Most Efficient Organizations,” whether they are involved in an A-76 evaluation or not. In addition, students have investigated the applicability of reverse auctioning techniques to the acquisition of non-information technology (IT) purchases. This research revealed that many challenges remain to be addressed before reverse auctioning becomes ubiquitous; including competition issues and IT service provider constraints. Research on contingency contracting officer (CCO) training programs has directly benefited the warfighter by prioritizing the critical elements of training required for deployed CCOs. In addition, student research has developed a contracting career force manning model now used by SAF/AQC and AFPC to optimize manning levels, accessions, and cross training policies.



Contact Information

Maj Bryan Hudgens

Maj Hudgens is currently completing his doctoral program at the University of Oklahoma and is scheduled to arrive in September 2003. Until then, please contact Maj Danny Holt.

Tel: (937) 255-3636 x4574 (DSN 785-3636)

Email: Daniel.Holt@afit.edu

Systems Management

Research Areas

- Program Management
- Knowledge Management
- Acquisition Reform
- Change Management
- Diffusion of Innovations
- Business Process Improvement



by HQ USAF/XOOT, research developed more effective resource management policies regarding space/missile operations crews.



Recent Successes

The systems management program addresses the inherent challenges faced by project managers in understanding the systems engineering process and directing all phases of weapon system research, development, and acquisition within the DoD and USAF. An active area of research is the transfer of military technology to civilian applications. To help guide decision makers, student research resulted in the creation of a framework for developing marketing plans to be used in the technology transfer process. To further assist program managers, research identified cost patterns associated with the management of technology transfer actions and explored the utility of using third parties to manage the transfer program. Sponsored

Contact Information

Lt Col Ross McNutt

Lt Col McNutt is currently assigned to Air Command and Staff College at Maxwell AFB, Alabama, and is scheduled to arrive in FY2003. Until then, please contact Lt Col Al Thal.

Tel: (937) 255-3636 x4798 (DSN 785-3636)

Email: Alfred.Thal@afit.edu

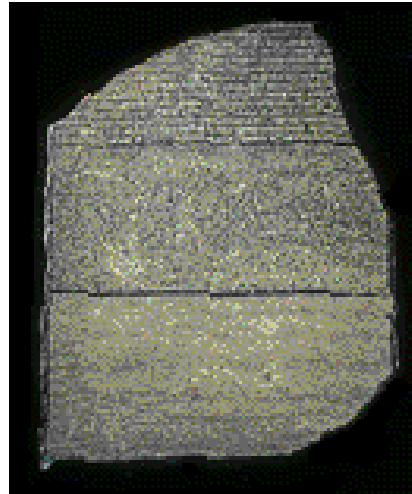
Information Resource Management

Information Systems Management

Research Areas

- Roles and Responsibilities of the Chief Information Officer (CIO)
- Information Operations
- Knowledge Management
- Information System Trust
- Long-Term Access to Digital Information

An additional research success addressed the problem of maintaining long-term access to digital documents and provides a methodology for overcoming access difficulties due to technological obsolescence. This research conceptualized the digital Rosetta Stone.



Recent Successes

A major area of research success for the IRM/ISM programs is information assurance. Under a grant from the Air Force Office of Scientific Research, IRM faculty and students tackled issues of information systems trust, training, media type, and gender in information systems. In doing so, members of the IRM/ISM program were invited to team with researchers at the University of Arizona and Florida State University to conduct the studies.

The program also experienced significant growth in knowledge management research. In addition to the development of a model that allows the incorporation of organization culture factors into the selection of Air Force knowledge management projects, an in-depth investigation of the maturity of Air Force Material Command (AFMC) communities of practice was conducted. Also, a new survey instrument was developed to measure the readiness of organizations for knowledge management initiatives. This research was accomplished in conjunction with AF customers such as AFMC and ASC and the results were immediately usable by these customers and other members of the Air Force/DoD community.

The IRM/ISM program works closely with the Air Force CIO office, undertaking a number of studies of value to that office. A recent study explored the appropriate roles and responsibilities for MAJCOM CIO offices, focusing on the office at Kirtland AFB. Another study investigated alternate strategies for implementing an Air Force-wide network server consolidation initiative. Currently, a research effort is underway to investigate problems associated with improving response times to time compliance network orders (TCNOs). Once a vulnerability is identified, the entire network is at risk until a fix is implemented network-wide. This study will focus on identifying the reasons for delays in implementing the fixes, with the goal of finding ways to improve response time to these critical operations.

Contact Information



Dr Alan R. Heminger

Associate Professor of Information Resource Management

PhD, Management Information Systems
University of Arizona
Tel: (937) 255-3636 x4797 (DSN 785-3636)
Email: Alan.Heminger@afit.edu

Research Interests:

- Strategic information management
- Long-term access to digital information
- Information ownership versus stewardship in organizations
- Knowledge management (KM)



Lt Col Summer E. Bartczak

Assistant Professor of Information Resource Management

PhD, Management Information Systems
Auburn University
Tel: (937) 255-3636 x4826 (DSN 785-3636)
Email: Summer.Bartczak@afit.edu

Research Interests:

- Knowledge management (KM)
- Knowledge management systems
- IT/KM strategy
- IT/KM workforce issues
- IT/KM innovation and change

ENV FACULTY LIST

Col Joseph H. Amend III	(937) 255-3636 x4591 (DSN 785)	Joseph.Amend@afit.edu
Lt Col Summer E. Bartczak	(937) 255-3636 x4826 (DSN 785)	Summer.Bartczak@afit.edu
Dr Charles A. Bleckmann	(937) 255-3636 x4721 (DSN 785)	Charles.Bleckmann@afit.edu
Maj Ellen England	(937) 255-3636 x4711 (DSN 785)	Ellen.England@afit.edu
Dr Mark N. Goltz	(937) 255-3636 x4638 (DSN 785)	Mark.Goltz@afit.edu
Maj Michael (Mike) A. Greiner	(937) 255-3636 x4588 (DSN 785)	Michael.Greiner@afit.edu
Dr Alan R. Heminger	(937) 255-3636 x4797 (DSN 785)	Alan.Heminger@afit.edu
Maj Daniel (Danny) T. Holt	(937) 255-3636 x4574 (DSN 785)	Daniel.Holt@afit.edu
Dr. Jan P. Muczyk	(937) 255-6565 x4315 (DSN 785)	Jan.Muczyk@afit.edu
Lt Col Alfred (Al) E. Thal, Jr.	(937) 255-3636 x4798 (DSN 785)	Alfred.Thal@afit.edu

New Incoming ENV FACULTY

Maj Bryan Hudgens	Contact: (937) 255-3636 x4574 (DSN 785)	Daniel.Holt@afit.edu
Lt Col Ross McNutt	Contact: (937) 255-3636 x4798 (DSN 785)	Alfred.Thal@afit.edu

Research Information



Thesis sponsorship

Historically, approximately 95% of our students' theses have been directly sponsored by USAF, DoD, and other federal agencies. Such sponsorship enables our students and faculty to deliver significant, relevant research products that contribute to the technological superiority and management expertise of the USAF. We highly encourage inputs to help focus our research efforts in areas pertinent to the respective career fields.

An individual (or organization) who submits a thesis topic proposal, or who otherwise endorses a student's thesis topic, will be identified as a "sponsor" of the thesis if the topic proposal is selected (confidentiality may be requested). Identification as a "sponsor" does not necessarily imply financial sponsorship, although organizations may elect to provide direct or indirect support for a student's thesis project.

The sponsor's organization benefits from the use of AFIT student and faculty resources to investigate solutions to current challenges. Sponsors receive a copy of the completed thesis and any other appropriate and relevant products resulting from the research effort (e.g., computer code, models, briefings, etc.).

Topic Submission Procedure

1. Review the research areas and faculty interests in this book and match your requirements with AFIT's capabilities.
2. Contact a faculty member with related expertise to discuss your idea for a thesis topic. This discussion is essential because students may only select topics that are of appropriate difficulty and are matched sufficiently to faculty expertise.
3. Submit a formal thesis topic proposal, using the sample format provided at the end of this book, and mail it to the address shown below. You may also submit your proposal electronically at <http://en.afit.edu/env/theform.htm>.

Department of Systems and Engineering Management
AFIT/ENV
2950 P Street, Bldg 640
Wright-Patterson AFB, OH 45433-7765

4. Thesis topic proposals are accepted continuously, but we highly recommend that they be submitted by 1 December 2003 for timely consideration. Following topic selection, thesis research completion requires approximately 12-15 months.

Sample Thesis Topic Proposal

***** S A M P L E *****

PROPOSED THESIS TOPIC

1. **THESIS TOPIC:** Acquisition Strategy for SABER Contracts and its Potential Impact on Contractor Performance
2. **INDIVIDUAL SPONSOR:** Capt Frank Simas (DSN 785-4552)
AFIT/CEM
2950 P Street, Bldg 643
Wright-Patterson AFB OH 45433-5332
3. **AFIT FACULTY CONTACTED:** Lt Col Heidi Brothers
4. **BACKGROUND/PROBLEM:** The purpose of the Simplified Acquisition of Base Engineering Requirements (SABER) contract is to reduce the time required to award minor construction projects. Recently, a number of installations have experienced problems on SABER contracts such as contractor's going out of business and sub-standard performance. These problems indicate that the current SABER acquisition strategy may be contributing to poor contractual performance.
5. **OBJECTIVE/APPROACH:**
 - a. Identify bases experiencing SABER contract problems
 - b. Identify factors contributing to problems at each base
 - c. Analyze factors to determine if a trend exists
 - d. Propose improvements to SABER acquisition strategy to avoid additional problems in future
6. **RESOURCE REQUIREMENTS:** Access to individuals responsible for SABER contracts, including SABER contractors; TDY funding to accomplish data collection
7. **REFERENCES:** SABER documentation and previous studies

***** S A M P L E *****

AFIT Centers of Excellence

The **Center for Systems Engineering** (CSE) strives to be the nationally recognized Center of Excellence for Systems Engineering, accommodating the complete spectrum of Systems Engineering from theory to practice as it applies to Department of Defense weapon systems. Center personnel support education programs, conduct research and sponsored projects, and provide consultation services in all areas of Systems Engineering to include Systems Architecture, Evolutionary Acquisition, Risk Management, and Project Management. <http://cse.afit.edu/research.html>



The **Center for Directed Energy** (DE) supports Air Force and Department of Defense agencies in transitioning high energy lasers and high power microwaves to the battlefield through vigorous scientific and engineering research, graduate education programs, and diverse consulting activities. <http://en.afit.edu/de>

The **Center for Information Security Education and Research** (CIER) is one of the National Security Agency (NSA) designated Centers of Academic Excellence in Information Assurance Education (CAE/IAE). CIER's objective is to increase the number of Information Assurance (IA) professionals through graduate-level education, degrees, and certificates in IA. <http://en.afit.edu/issa>



The **Center for MASINT Studies and Research** (CMSR) is focused on Air Force and Department of Defense MASINT (Measurement and Signature Intelligence) scientific, technical, and operational activities through graduate research programs. CMSR is a national resource for educating a new generation of MASINT professionals. <http://en.afit.edu/enp/cmsr/cmsr.html>

The **Center for Operational Analysis** (COA) is dedicated to research and education in operational analysis with an emphasis on enhancing warfighter efficiency and effectiveness at all levels through applications of advanced modeling techniques, algorithms and technology. <http://en.afit.edu/coa>





**GRADUATE SCHOOL OF
ENGINEERING AND MANAGEMENT**

Air Force Institute of Technology

2950 HOBSON WAY, WPAFB OH 45433-7765



<http://en.afit.edu>